



Project Summary Report O-4160-S

URL: <http://tti.tamu.edu/documents/O-4160-S.pdf>

Project O-4160: Operating Freeways with Managed Lanes

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## Findings from Texas: Five Years of Research on Managed Lanes—Summary Report

The increasing population growth in Texas has placed enormous demands on the transportation infrastructure, particularly the freeway systems. There is a growing realization that the construction of sufficient freeway lane capacity to provide free-flow conditions during peak travel periods cannot be accomplished in developed urban areas due to cost, land consumption, neighborhood impacts, environmental concerns, and other factors. Like other transportation agencies nationwide, the Texas Department of Transportation (TxDOT) is searching for methods to better manage traffic flow and thus improve the efficiency of existing and proposed networks.

A viable method for meeting mobility needs is the concept of “managed” lanes, which is growing in popularity among users and agencies alike. TxDOT anticipates that the managed lanes operational approach can offer peak-period free-flow travel to certain user groups by using strategies that manage demand in

the lanes. These user groups might be high-occupancy vehicles (HOVs), trucks, toll-paying vehicles, transit, low-emission vehicles, or some combination of these and other groups. Moreover, the eligible user groups can vary by time of day or other factors depending on available capacity and the mobility needs of the community. Strategies that vary toll rate according to congestion levels and that control access to the lanes can also have a role in managing demand in the facility.

Thus, TxDOT initiated this multi-year project to research the complexities of designing a practical, flexible, safe, and efficient facility that may have multiple operating strategies throughout the course of a day, week, year, or beyond to help ensure the successful implementation of managed lanes in Texas.

### What We Did...

The Texas Transportation Institute (TTI), in partnership with Texas Southern University (TSU), embarked on a five-year effort to answer numerous critical questions regarding managed lanes facilities

(see Figure 1). Through a well-defined and coordinated project management strategy, key researchers who possess expertise in specific areas of interest led the various project tasks with guidance from the research supervisors; the TxDOT program coordinator, project director, and project monitoring committee; an external stakeholder committee; and ad hoc task-related technical advisory committees. Table 1 shows the major questions addressed by the project.

### What We Found...

The research project developed more than 150 products over the course of its five years. Material is available on the Internet at <http://managed-lanes.tamu.edu>. The products include technical papers, abstracts, journal and magazine articles, reports, bulletins, brochures, newsletters, technical memoranda, presentations, and a handbook and screening tool for managed lanes strategy selection. Table 2 lists reports that document project activities, findings, and recommendations.

The broad scope and long length of this project allowed



Table 1. Research Questions.

Managed Lanes Project Phase	Critical Question Answered by Research
<b>Planning Managed Lanes Facilities</b>	What are the operational options available for a managed lanes facility? How does an intended user group(s) affect a managed lanes facility's design and operations? What defines a successful managed lanes project? How can I fund and finance a managed lanes project? How do I market a managed lanes project to help make it a success? How do I integrate other key agencies (transit, toll, law enforcement, etc.) into a managed lanes project to help overcome institutional issues and barriers? Are there any interim or temporary uses for a managed lanes facility?
<b>Designing Managed Lanes Facilities</b>	How do I design a managed lanes facility to handle a selected user group? How can I design a managed lanes facility to be flexible for future needs? What safety issues do I need to be aware of when designing a managed lanes facility? What interoperability issues do I need to be aware of when designing a managed lanes facility? What information do users need to make decisions about using a managed lanes facility? What approaches to delivering user information can be used to provide information appropriately?
<b>Operating Managed Lanes Facilities</b>	What is the best way to enforce a managed lanes facility? How do I handle incidents on a managed lanes facility? What staff do I need to manage a managed lanes facility, and what training do they need? How do I evaluate and monitor a managed lanes facility to determine success?

the research team to investigate the complex issues of managed lanes in a comprehensive manner. The researchers provided results to TxDOT as tasks were completed to help ensure the timely implementation of findings into current projects, and they shared those results with the transportation community through an Internet site and electronic newsletter.

Four key products of note that this project produced were two position papers, a preliminary screening tool, and a handbook. One position paper, entitled *Managed Lanes: More Efficient Use of the Freeway System* (Product 4160-P1), provides policy makers with information about managed lanes, how they may be operated, the benefits of managed lanes, where successful projects have been implemented, and what

TxDOT is planning for Texas. The second paper, entitled *Managed Lanes: A New Concept for Freeway Travel* (Product 4160-P2), is tailored to editorial staff, transportation reporters, and others in the media. By educating the media on this concept, this paper will place media representatives in a better position to accurately portray the concept to the general public. Both documents provide an effective means of communicating information about managed lanes to the target audiences.

A user-friendly preliminary screening tool was developed to assist TxDOT in identifying managed lane strategy options very early in the conceptual planning process. The framework for the decision support methodology is the backbone for the *Managed Lanes Handbook*

(Report 0-4160-24). The handbook includes all of the project research in a usable format, providing a clear, concise, and step-wise approach to planning, designing, operating, and enforcing a managed lanes facility. It also refers the user to other pertinent documents that provide additional detailed information on various aspects of managed lanes, offer the resources and guidance to develop a managed lanes project, and address characteristics unique to individual facilities.

### The Researchers Recommend...

The research team recommends that TxDOT encourage its personnel to use the *Managed Lanes Handbook* and other research products from this project to develop managed lanes facilities



Table 2. Principal Research Reports.

Report Number	Title	Report Number	Title
4160-1	Managed Lanes Symposium—Conference Proceedings	4160-15	Year 3 Annual Report of Progress: Operating Freeways with Managed Lanes
4160-2	Year 1 Annual Report of Progress: Operating Freeways with Managed Lanes	0-4160-16	Traffic Control Devices for Managed Lanes
4160-4	Managed Lanes—Traffic Modeling	0-4160-17	Incident Management for Managed Lanes
4160-5	Developing a Managed Lanes Position Paper for a Policy-Maker Audience	0-4160-18	Interoperability Issues on Managed Lanes Facilities
4160-6	Developing a Managed Lanes Position Paper for a Media Audience	0-4160-19	Year 4 Annual Report of Progress: Operating Freeways with Managed Lanes
4160-7	Marketing the Managed Lanes Concept	0-4160-20	Staffing and Training Needs for Managed Lanes Facilities
4160-8	State and Federal Legislative Issues for Managed Lanes	0-4160-21	Decision Framework for Selection of Managed Lanes Strategies
4160-9	The Funding and Financing of Managed Lanes Projects	0-4160-22	Strategies for Interim Use of Managed Lanes
4160-10	Managed Lane Ramp and Roadway Design Issues	0-4160-23	Monitoring and Evaluating Managed Lane Facility Performance
4160-11	Enforcement Issues on Managed Lanes	0-4160-24	Managed Lanes Handbook
4160-12	Year 2 Annual Report of Progress: Operating Freeways with Managed Lanes	0-4160-25	Findings from Texas: Five Years of Research on Managed Lanes
0-4160-13	Identification of Traveler Information and Decision-Making Needs for Managed Lane Users		

that meet the mobility needs of Texans across the state. They also recommend that TxDOT consider opportunities in the future to sponsor additional research in the area of managed lanes to help answer both the questions that this project generated and those that will arise as more of these complex facilities become operational. Such an effort will help to continue to advance the state-of-the-art and state-of-the-practice in operations management and help secure TxDOT’s leadership role in this endeavor.

Figure 1. Project Team Members.



## For More Details...

Visit the managed lanes website at <http://managed-lanes.tamu.edu> for a detailed listing of products developed throughout this project. Many of the products listed are available on-line in portable document file (PDF) format. The products are categorized in the following areas: Overall Project Research, Traffic Modeling, Concept Marketing, Legislation, Funding and Financing, Geometric Design, Enforcement, Traveler Information, Traffic Control Devices, Incident Management, Interoperability, Decision Matrix, Interim Use, Staffing and Training, and Evaluation and Monitoring.

A complete product listing is available in Report 0-4160-25, *Findings from Texas: Five Years of Research on Managed Lanes*.

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